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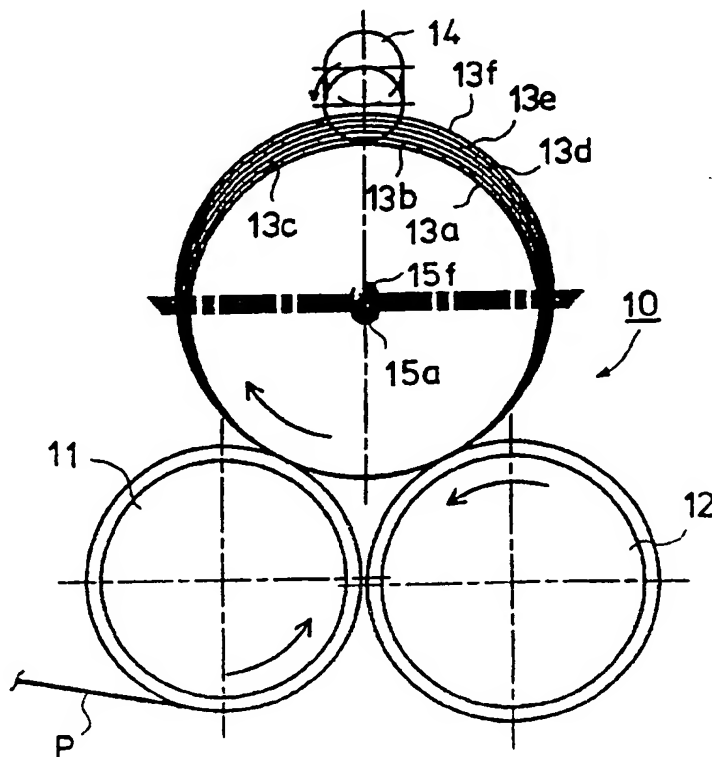


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(54) Title: METHOD IN WINDING**(57) Abstract**

The invention concerns a method in winding, wherein a number of separate rolls (13a, 13b, 13c, 13d, 13e, 13f) are formed side by side around separate roll spools (15a, 15b, 15c, 15d, 15e, 15f) placed one after the other while supported by support members (11, 12). In order to reduce the friction coefficient of the roll spools (15a, 15b, 15c, 15d, 15e, 15f), before, or at the same time as, the roll spools are placed in the winding position, the ends of the roll spools are treated with an agent that reduces the friction coefficient, or pieces of a material that has a low friction coefficient are placed at the ends of the roll spools, and/or the axial thrust force between the roll spools is lowered by passing a pressurized medium through the spool locks.



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Method in winding

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The invention concerns a method in winding, wherein a number of separate rolls are formed side by side around separate roll spools placed one after the other while supported by support members.

- 10 Owing to variations in the cross-direction profiles, for example thickness, moisture and roughness, of the web to be wound, adjacent rolls are not formed with precisely equally large diameters, in spite of the fact that, in principle, precisely equally long component webs are wound into them. Owing to the different diameters of the rolls, the roll spools placed in the roll centres are displaced with the progress of winding
- 15 in relation to one another so that their centres of rotation are separated and, at the same time, minor variations occur in the angular speeds of the rolls. Since the roll centres are, however, during the entire winding process, in contact with each other, diverting forces arise between the ends of the roll spools, and the rolls tend to "jump", in which connection the rolls that are being formed can be damaged. Owing
- 20 to this detrimental oscillation, in carrier-drum winding, it is, as a rule, necessary to run at a lower speed, i.e. to be content with a lower winding speed, which reduces the capacity of the machine and is, thus, uneconomical.

- The problem described above has occurred as long as winders of the carrier drum
- 25 type have been in use. The seriousness of the problem has, however, varied in the course of years, because the profile of the web produced in a paper machine has improved and, at the same time, the roll size and the winding speed have changed to a little extent only. In recent years, the diameters of the customer rolls produced have started becoming ever larger and, at the same time, the winding speeds have
- 30 also increased, for which reason the problem of oscillation has been noticed again: even a little variation of profile in the direction of width of the web is cumulated

especially during winding of thin paper grades so that faults in the shape of the rolls which arise from the web profile cause a significant oscillation problem.

In the winding process, a number of different phenomena are effective which attempt
5 to shift the web rolls that are being formed in their axial direction:

- deflection of the winding cylinders, i.e. carrier drums,
- faults in the shape of the rolls arising from uneven profile of the web, and
- also the spool locks, which support the roll spools of the lateral web rolls,
10 subject the row of rolls to axial forces when they keep the row of rolls in the desired location.

The spool locks alone can also produce a compression force applied to the whole row of roll spools when the roll spools are excessively long: the total length of the
15 roll spools is higher than the regulated distance between the spool locks.

The phenomena described above can, either alone or together, produce situations in which the ends of the roll spools of the rolls tend to be pressed against each other and thereby to produce a relative support force.
20

Thus, there are several factors that produce a relative axial thrust force between the rolls. The spool locks, which keep the lateral roll spools in their positions, keep the row of rolls in the correct winding position in the lateral direction, but deflection of the carrier drums drives the rolls towards the lowest point of deflection. Variations
25 in the web profile produce a "carrot shape" even in individual rolls, in which case the rolls tend to move in the lateral direction. Of course, variations in the lengths of the roll spools, together with the spool locks, cause variation in the axial forces in different forms. It comes out from the above that there are a number of different reasons why the rolls tend to be pressed against each other during winding.
30

In prior-art solutions, attempts have been made to attenuate the detrimental oscillation occurring in carrier-drum winders by various means. In the *Patent DE-742,833*

(granted Dec. 29, 1943), the problem of oscillation of the rolls formed by winders of the carrier-drum type has been described, and a solution has been described for reducing the oscillation. In this prior-art solution, the rolls are pressed lightly by means of a cutting roll which operates as an extra support roll, whereby attenuation
5 of the oscillation of the rolls is produced.

A similar attenuation of oscillation produced by means of a separate roll has been applied in the *Patent DE-3,924,612*.

10 With respect to the prior art, reference is also made to the publications *FI-841448* and *FI-49,276*, in which some typical carrier-drum winders are described, in which, of course, the detrimental oscillation problem of carrier-drum winders occurs.

It is a second prior-art mode of eliminating the problem of oscillation that relative
15 movements of the roll spools constituting the centres of the rolls are prevented either so that an axle is placed inside the roll spools, which axle keeps the central axes of the rolls immobile in relation to one another, or so that the rolls are formed onto a continuous roll spool. In both modes, it is a drawback that separation of the rolls formed from one another causes significant additional work and, thus, also reduced
20 productivity. Moreover, when winding takes place around the same centre, the roll diameters become equally large, but, owing to variations in the cross-direction profile of the web, their internal tightness varies. This is not desirable in the procedures of further processing of the rolls.

25 The problems described above occur in all such winder types in which the location/support of the web rolls that are formed comply with the following terms:

- the roll spools (web rolls) are placed one after the other coaxially so that the location of each roll spool is determined by means of the adjacent roll spools,
30
- the roll spools (web rolls) are supported under optimal conditions in the radial direction of the rolls only (the spool locks just prevent axial movement

arising from faults in the roll shapes and from deflection of the winding members).

5 The object of the present invention is to provide an improvement of the method described above in winding. It is a specific object of the invention to provide a method which solves the detrimental problem of oscillation occurring, for example, in carrier-drum winding better than in the prior-art solutions.

10 The objectives of the invention are achieved by means of a method which is characterized in that, in order to reduce the friction coefficient of the roll spools, before or at the same time as, the roll spools are placed in the winding position, the ends of the roll spools are treated with an agent that reduces the friction coefficient, or pieces of a material that has a low friction coefficient are placed at the ends of the roll spools, and/or the axial thrust force between the roll spools is lowered by
15 passing a pressurized medium through the spool locks.

In the solution in accordance with the invention, it has been realized to reduce the impulse that causes the oscillation. This is why, in carrier-drum winders, as a rule, it is no longer necessary to use various solutions of attenuation of oscillation, which
20 require separate solutions of additional equipment and, thus, result in additional costs. Thus, in the present invention, it has been noticed that the intensive oscillation of the rolls during winding arises primarily from the relative movements of the roll spools and from the friction forces between the roll spools. In the present invention, it has been realized to reduce the friction forces between the roll spools.

25 In a preferred embodiment of the invention, the friction coefficient is lowered by lubricating the ends of the roll spools with oil, which is absorbed into the end of the roll spool and which reduces the friction coefficient between the ends of the roll spools, in which connection the friction force is also lowered, and so also the
30 impulse that produces the detrimental oscillation. Of course, according to the invention, the friction coefficient can also be lowered by means of other substances

that are applied to the ends of the roll spools and that lower the friction coefficient, for example by means of waxes or fats.

In a second preferred embodiment of the invention, the contact force, i.e. the axial thrust force, between the ends of the roll spools, is lowered by feeding a pressurized medium, preferably compressed air, into the row formed by the roll spools, for example, through the spool locks, in which connection the compressed air discharged between the roll spools attempts to keep the rolls that are being formed apart from one another and thereby reduces the friction force between the roll spools. For example, if the set of spools is "excessively long", the supply of compressed air also reduces the axial thrust forces of the spool locks and, thus, the impulse that causes the detrimental oscillation.

The most significant advantage that is obtained by means of the invention is therein that, when the impulse that causes the oscillation is reduced substantially, in carrier-drum winders it is, as a rule, unnecessary to lower the winding speed, i.e. to reduce the capacity of the machine.

The invention will be described in detail with reference to some preferred embodiments of the invention illustrated in the figures in the accompanying drawings, the invention being, however, not supposed to be confined to said embodiments alone.

Figure 1 is a schematic side view of a conventional carrier-drum slitter-winder.

Figure 2 is a schematic illustration viewed from ahead of a problem occurring in a carrier-drum slitter-winder as shown in Fig. 1.

Figure 3 is a schematic illustration viewed from ahead of a second problem occurring in a carrier-drum slitter-winder as shown in Fig. 1.

Figure 4 is a schematic illustration on an enlarged scale of the detail A taken from Fig. 2 and showing the way in which the ends of two adjacent roll spools contact each other.

- 5 Figure 5 is a top view of a preferred solution of equipment for treatment of the ends of the roll spools with an agent that lowers the friction coefficient.

Figure 6 is a sectional view taken along the line VI-VI in Fig. 5.

- 10 Figure 7 shows a second preferred embodiment for treatment of the ends of the roll spools in a way that lowers the friction coefficient.

In Figs. 1...4, the carrier-drum slitter-winder is denoted generally with the reference numeral 10. The carrier-drum slitter-winder comprises a first carrier drum 11 and
15 a second carrier drum 12. The rolls that are being formed are denoted with the reference numerals 13a, 13b, 13c, 13d, 13e and 13f. The reference numeral 14 denotes the rider roll. The roll spools of the rolls are denoted with the reference numerals 15a, 15b, 15c, 15d, 15e and 15f. The spool locks that prevent axial movements of the lateral rolls are denoted with the reference numeral 16.

20

The distance s between the web rolls is regulated by means of a web separation device before the winding, so that the rolls do not adhere to one another as a result of relative overlapping of the separate webs.

- 25 Figs. 2 and 3 show the differences in web roll diameters arising from two different profiles of material web, which differences in diameters cause shifting of the roll spools 15a, 15b, 15c, 15d, 15e and 15f so that their axes of rotation are not on the same line, compared with one another.

- 30 In Fig. 4 it is shown how the ends of, for example, the roll spools 15a and 15b reach contact with one another. The distance between the rolls 13a and 13b is denoted with the letter s .

In Figs. 5 and 6, the device for treatment of the ends of the roll spools with an agent that lowers the friction coefficient is denoted generally with the reference numeral 20. In this embodiment the device 20 comprises an oil space 21, in which there is oil 22. The reference numeral 23 denotes the roll, i.e. the oil transfer wheel, and the reference numeral 24 denotes the spool pusher. The reference numeral 26 denotes the filling opening and the plug of the oil tank 21. The reference numeral 27 denotes the plate between the spool pusher 24 and the oil tank 21. During the pushing movement, the roll 23 that is in an oil bath transfers oil 22 to the end of the roll spool 15. The reference numeral 25 denotes the wheel that rotates the spool, by means of which wheel the revolving movement of the roll spool 15 is produced. Owing to the solution, the end of the roll spool 15 is lubricated very well with oil, in which connection the friction coefficient between the ends of the roll spools 15 is lowered to a considerable extent.

In the embodiment shown in Fig. 7, the friction coefficient of the end of the roll spool 15 is lowered by to the end of the roll spool 15 fitting an end piece 17 that has a low friction coefficient. In this embodiment, a flange-shaped or sleeve-shaped end piece 17 has been used, which has been attached to the roll spool 15 by means of O-ring seals 18.

Above, just some preferred embodiments of the invention have been described, and it is obvious to a person skilled in the art that numerous modifications can be made to said embodiments within the scope of the inventive idea defined in the following patent claims.

Claims

1. A method in winding, wherein a number of separate rolls (13a,13b,13c,13d,13e, 13f) are formed side by side around separate roll spools (15a,15b,15c,15d,15e,15f)
5 placed one after the other while supported by support members (11,12), **character- ized** in that, in order to reduce the friction coefficient of the roll spools (15a,15b, 15c,15d,15e,15f), before, or at the same time as, the roll spools are placed in the winding position, the ends of the roll spools are treated with an agent that reduces the friction coefficient, or pieces of a material that has a low friction coefficient are
10 placed at the ends of the roll spools, and/or the axial thrust force between the roll spools is lowered by passing a pressurized medium through the spool locks (16).
2. A method as claimed in claim 1, **characterized** in that oil is used as the agent that lowers the friction coefficient.
15
3. A method as claimed in claim 1, **characterized** in that a wax is used as the agent that lowers the friction coefficient.
4. A method as claimed in claim 1, **characterized** in that a fat is used as the agent
20 that lowers the friction coefficient.
5. A method as claimed in claim 1, **characterized** in that flange-shaped members (17) that are fitted to the ends of the roll spools (15a,15b,15c,15d,15e,15f) are used as the pieces of material that lower the friction coefficient.
25
6. A method as claimed in any of the claims 1 to 5, **characterized** in that compressed air is used as the pressurized medium.
- 30

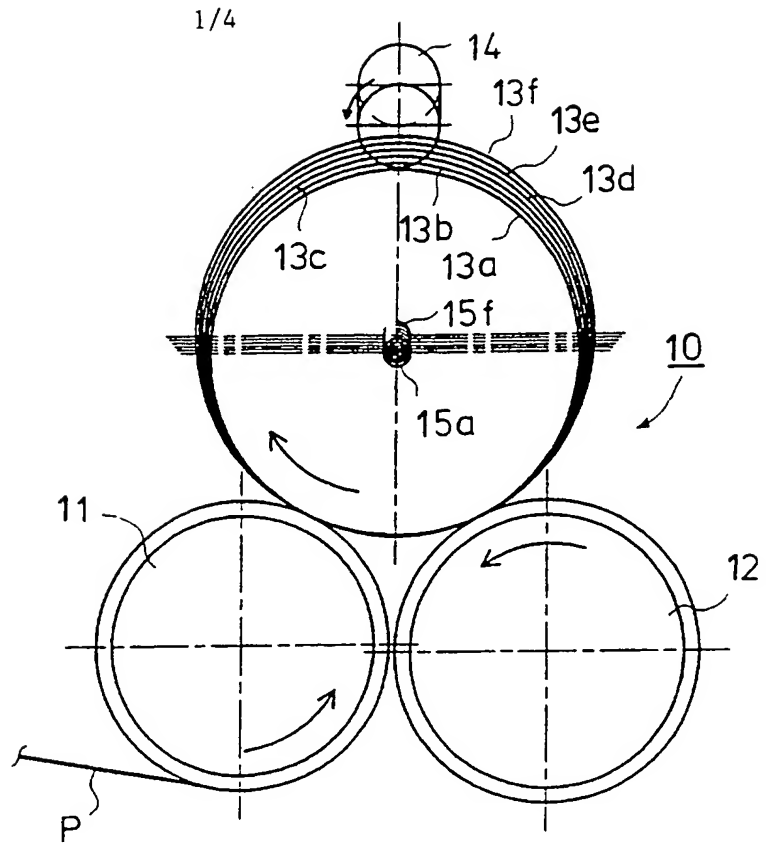


FIG. 1

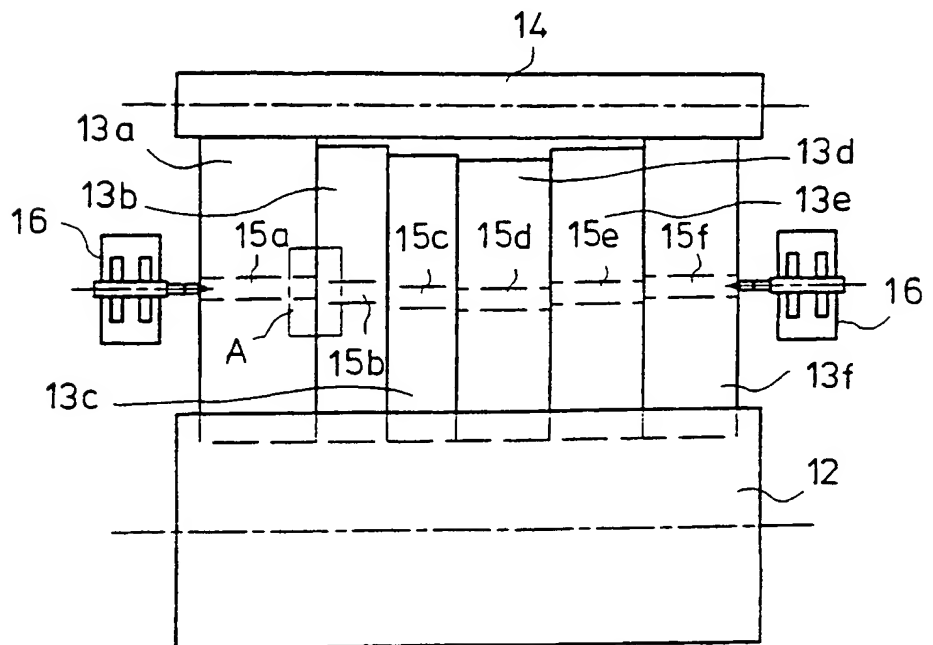


FIG. 2

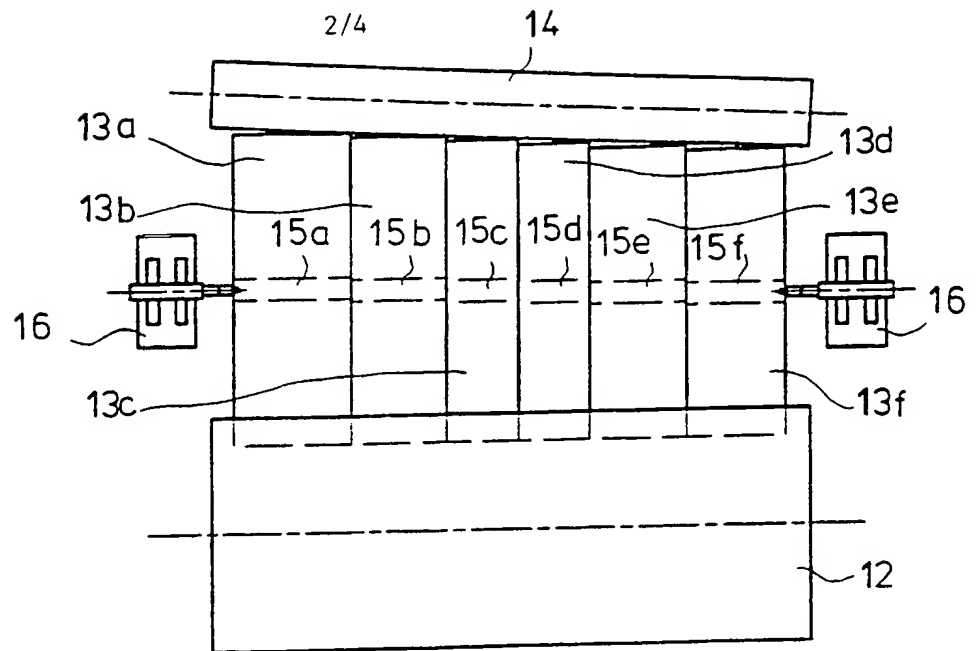


FIG. 3

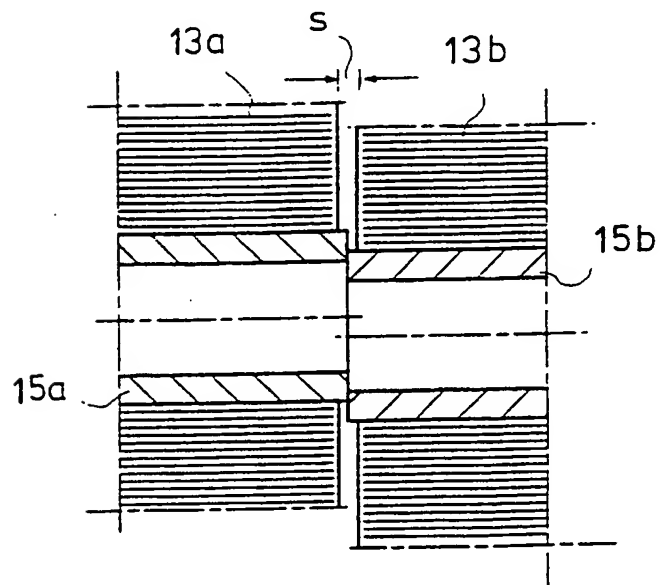


FIG. 4

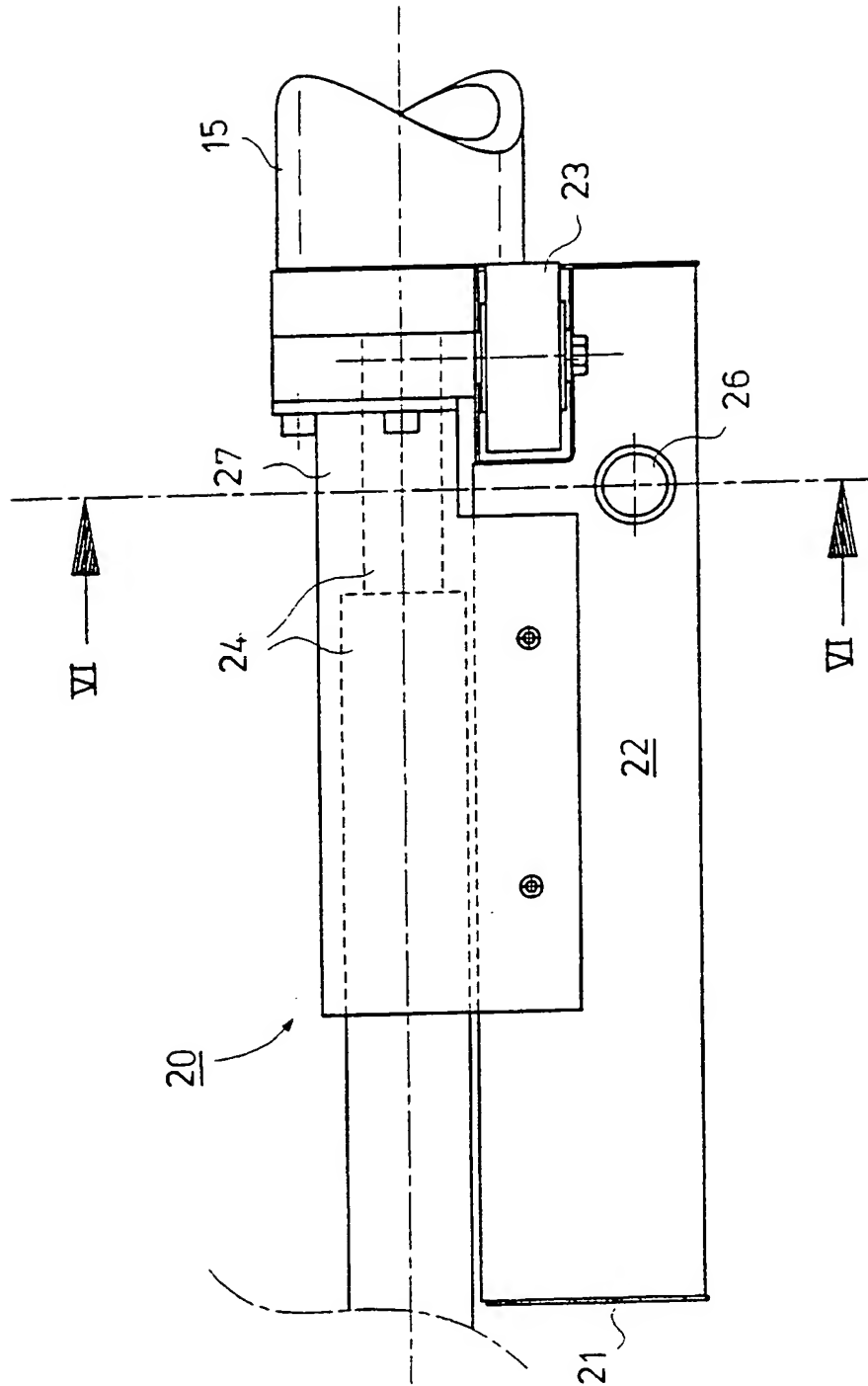


FIG. 5

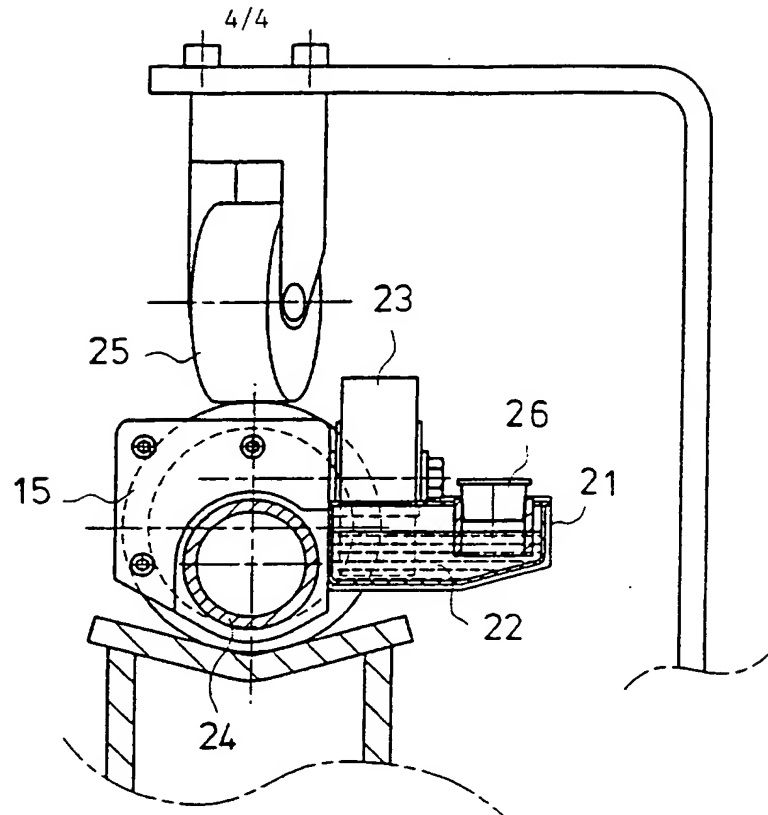


FIG. 6

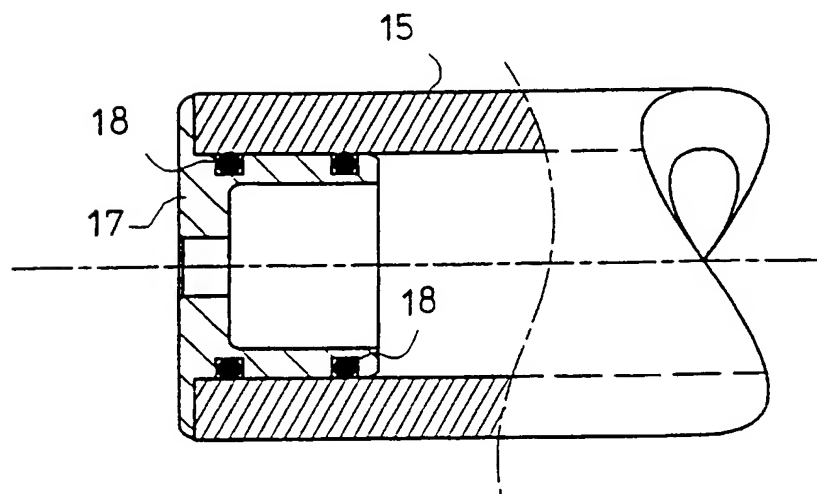


FIG. 7

INTERNATIONAL SEARCH REPORT

International application No.

PCT/FI 96/00570

A. CLASSIFICATION OF SUBJECT MATTER

IPC6: B65H 19/30, B65H 75/30, B65H 18/20

According to International Patent Classification (IPC) or to both national classification and IPC

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C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 3512727 A (J.S. PALOVAARA), 19 May 1970 (19.05.70), figures 1-6, abstract --	1-6
A	NO 67455 C1 (JAGENBERG-WERKE A/G), 14 February 1944 (14.02.44), page 1, line 3 - page 2, line 12, claim 8 --	1-6
A	US 3837593 A (G.W. DÖRFEL), 24 Sept 1974 (24.09.74), figures 6-9, abstract --	1-6
A	WO 9513980 A1 (BELOIT TECHNOLOGIES, INC.), 26 May 1995 (26.05.95), figures 1-3, abstract -- -----	1-6

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International application No.

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US-A- 3512727	19/05/70	DE-A- 1611778 GB-A- 1180302 SE-B- 354308	28/01/71 04/02/70 05/03/73
NO-C1- 67455	14/02/44	NONE	
US-A- 3837593	24/09/74	AT-B- 324114 CA-A- 973860 DE-A- 2147673 GB-A- 1366743 SE-B,C- 373175	11/08/75 02/09/75 29/03/73 11/09/74 27/01/75
WO-A1- 9513980	26/05/95	CA-A- 2176957 DE-U- 9317616 EP-A- 0729432 FI-A- 962096 PL-A- 314291	26/05/95 16/03/95 04/09/96 17/05/96 02/09/96

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